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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,503	12/27/2000	John N. Hait	2807.2.14.5	2170

35430 7590 02/23/2004

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EXAMINER

LEUNG, CHRISTINA Y

ART UNIT	PAPER NUMBER
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2633

DATE MAILED: 02/23/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/753,503

Applicant(s)

HAIT, JOHN N.

Examiner

Christina Y. Leung

Art Unit

2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-60 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-60 is/are rejected.
- 7) ☒ Claim(s) 60 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 December 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 4.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 60 is objected to because of the following informalities:

Claim 60 recites "further comprising a compact, adjustable, integrated splitter and combiner," but claim 53, on which the claim indirectly depends, already recites "a beam splitter" and "a beam combiner." Examiner respectfully suggests that Applicant amend claim 60 to recite that the beam splitter and combiner elements already recited are compact, adjustable, and integrated, for example, instead reciting apparently additional elements. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 41 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 41 recites the limitation "the multi-generational descendant signal" in lines 1-2 of the claim. There is insufficient antecedent basis for this limitation in the claim, since claim 1 on which it depends does not specifically recite a "multi-generational" signal. Examiner respectfully suggests that the claim may depend from claim 40 instead.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 2633

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-15, 17-40, and 42-58 are rejected under 35 U.S.C. 102(e) as being anticipated by Hakimi et al. (US 6,404,526 B2).

Regarding claim 1, Hakimi et al. disclose a method for shaping a photonic signal (Figure 10A), the method comprising:

receiving a parent signal having a parent coherence length and being characterized by a parent duration;

splitting the parent signal into a first daughter signal and second daughter signal (at splitter 161);

delaying the second daughter signal with respect to the first daughter signal by a delay time (using delay element 160A); and

interacting the first daughter signal with the second daughter signal photonicallly during an interaction duration less than the coherence length (column 3, lines 1-23).

Regarding claim 2, Hakimi et al. disclose that the interaction is coherence spiking in which the interaction comprises constructive interference in an overlapping time period (Figure 8; column 8, lines 41-47).

Regarding claim 4, Hakimi et al. disclose that the delay time may be substantially equal to the parent duration. Figure 10A, for example, shows how a delay may be set to $\sim t$, where t is the duration/period of the incoming parent signal.

However, regarding claim 3 in particular, Hamiki et al. also disclose that the delay time may be less than the parent duration. Figure 11C, for example, shows how the variable delay may be set to a time that is half the duration of the incoming parent signal (the duration of the parent signal entering the variable delay half of the system shown in Figure 11C is $2t$, due to the processing by the fixed delay part of the system).

Regarding claim 5, Hakimi et al. disclose that the interacting further comprises providing a descendant signal (i.e., the output from a system such as shown in Figure 10A). They also disclose further comprising repeating the splitting, delaying, and interacting steps with the descendant signal (such as shown in Figure 10B, where the descendant signal from the fixed delay half of the system shown is split and delayed again). Furthermore, they disclose that the descendant signal corresponds to a descendant duration greater than the parent duration (Figure 10A, for example, shows a descendant duration that is twice the parent duration).

Regarding claim 6, Hakimi et al. disclose that the first and second daughter signals are coherent with one another. The first and second daughter signals are simply split from the parent signal as discussed above with regard to claim 1 and would necessarily share coherence time with each other.

Regarding claim 7, Hamiki et al. disclose that the parent signal has a coherence time corresponding thereto and wherein the first and second daughter signals share the coherence time. The first and second daughter signals are simply split from the parent signal as discussed above with regard to claim 1 and would necessarily share coherence time with the parent signal.

Regarding claim 8, Hakimi et al. disclose that the interaction endures for an interaction time selected to provide the interaction before the end of the coherence time with respect to the

Art Unit: 2633

first daughter signal. Figure 11C shows how the variable delay half of the system shown may provide an interaction before the end of the coherence time of the first daughter signal (i.e., the daughter signal split from the incoming parent signal at element 161).

Regarding claim 9, Hakimi et al. disclose that the interaction further comprises recombining the first and second daughter signals to form a descendant signal comprising a first region having a peak duration and second region having a base duration different from the peak duration (Figure 8; column 8, lines 41-47).

Regarding claim 10, Hamiki et al. disclose that the base duration and the peak duration are different from the parent duration (Figure 8; column 8, lines 41-47).

Regarding claim 9, Hakimi et al. disclose that the peak duration is less than the base duration (Figure 8, for example, shows how the base duration may extend greater than the peak duration).

Regarding claim 12, Hakimi et al. disclose that the peak duration is substantially less than the base duration and substantially less than the parent duration (Figure 8).

Regarding claim 13, Hakimi et al. disclose that the peak duration corresponds to a comparatively large amplitude and the base duration corresponds to a comparatively small amplitude (Figure 8).

Regarding claim 14, Hakimi et al. disclose that the daughter durations are substantially equal to the parent duration. Again, the daughter signals are simply split from the parent signal as discussed above with regard to claim 1 and would necessarily share durations with the parent signal.

Regarding claim 15, Hakimi et al. disclose combining the first and second daughter signals to form a descendant signal (i.e., the output from a system such as shown in Figure 10A).

Art Unit: 2633

They also disclose splitting the descendant signal into descendant daughter signals and interacting the descendant daughter signals (such as shown in Figure 10B, where the descendant signal from the fixed delay half of the system shown is split and delayed again).

Regarding claim 17, Hakimi et al. disclose combining the first and second daughter signals to form a descendant signal (such as the descendant signal from the fixed delay half of the system shown in Figure 10B); and splitting the descendant signal into at least two descendant daughter signals (in the second half of the system shown in Figure 10B, for example).

Regarding claim 18, Hakimi et al. disclose further comprising combining the at least two descendant daughter signals into a second descendant signal (the output from the second half of the system shown in Figure 10B, for example).

Regarding claim 19, Hakimi et al. disclose that the interaction comprises forming a descendant signal having a peak region of a comparatively greater amplitude, flanked by a base region of a comparatively lesser amplitude (Figure 8; column 8, lines 41-47).

Regarding claim 20, Hakimi et al. disclose that the base region further comprises a shoulder region, and a skirt region. Figure 8 shows a simplified illustration of the signal after interaction and does not explicitly show a "skirt region," but Figure 6 shows a more detailed illustration of similar signal with a shoulder region (elements 37 and 38) and a skirt region (elements 42 and 44; column 7, lines 19-37).

Regarding claim 21, Hakimi et al. disclose that the peak region, the shoulder region, and the skirt region are characterized, respectively, by a peak amplitude, a shoulder amplitude, and a skirt amplitude, of respectively descending values (Figure 6; column 7, lines 19-37).

Regarding claim 22, Hakimi et al. disclose splitting the descendant signal into descendant daughter signals and recombining the descendant daughter signals to form a second descendant signal (Figure 10B).

Regarding claim 23, Hakimi et al. disclose selecting a number of generations and encoding a generational descendant signal up to the number of generations, in order to provide a peak region having a substantially shortened peak duration and a base region below a noise level.

Hakimi et al. disclose that the peak region is detected while the base region falls below a selected noise level so that it is not detected (column 6, lines 64-66). Hakimi et al. also disclose that the number of generations may be 1, 2, 3, etc. (as Figures 10A, 10B, and 10C show respectively).

Regarding claim 24, Hakimi et al. disclose that the interaction further comprises forming a descendant signal resulting from the first and second daughter signals (i.e., the output from a system such as shown in Figure 10 A). They also disclose operating on the descendant signal to provide a function generation (for example, Figure 10B shows the descendant signal from the fixed delay half of the system shown is further operated on by a variable delay to produce another output generation).

Regarding claim 25, Hakimi et al. disclose shaping the photonic signal to reduce the energy density in a carrier medium of the signal (Figure 8; column 8, lines 41-58).

Regarding claim 26, Hakimi et al. disclose providing a plurality of photonic signals, with corresponding interactions of daughter signals, and increasing information throughput in a carrier medium of the plurality of signals while limiting the energy density in the carrier medium by reducing the duration of a corresponding plurality of descendant signals resulting from the

plurality of photonic signals. Figure 16 shows a system including providing a plurality of photonic signals (originating from lasers S1-5), with corresponding interactions of daughter signals (through encoder elements 280, which comprise elements such as shown in Figure 10A). Again, Hakimi et al. disclose shaping the photonic signal to reduce the energy density in a carrier medium of the signal (Figure 8; column 8, lines 41-58). Furthermore, Figure 16 shows how the signals are combined to increase the information throughput in the medium (fiber 52).

Regarding claim 27, Hakimi et al. disclose that the photonic signal is a pulse (Figure 10A, for example, clearly shows that the signals comprise pulses).

Regarding claim 28, Hakimi et al. disclose that the parent signal has a characteristic length, corresponding to the parent duration, and the first and second daughter signals have a coherence length less than the characteristic length. Figure 10B, for example, shows how a parent signal, output from the fixed delay half of the system, may be further split into daughter signals that share characteristic length and coherence length with the parent signal. The daughter signals would also necessarily have coherence length less than the characteristic length of the parent signal, since the coherence length of the parent signal is less than the characteristic length of the parent signal.

Regarding claim 29, Hakimi et al. disclose that the first and second daughter signals have substantially identical wave forms with respect to each other and to the parent signal, without consideration of amplitude. Again, Hakimi et al. disclose that the daughter signals are simply split from the parent signal and therefore would necessarily have substantially identical wave forms.

Regarding claim 30, Hakimi et al. disclose a method for shaping a photonic signal (Figure 10A), the method comprising:

receiving a parent signal having a parent coherence length and being characterized by a parent duration;

splitting the parent signal into a first daughter signal and second daughter signal (at splitter 161);

delaying the second daughter signal with respect to the first daughter signal by a delay time (using delay element 160A); and

interacting the first daughter signal with the second daughter signal photonically, during an interaction duration less than the coherence length, to produce an effect selected from coherence notching and coherence spiking (Figure 8; column 8, lines 41-47).

Regarding claim 31, Hakimi et al. disclose that the delay time is selected from the group consisting of a first time period less than the parent duration, a second time period substantially equal to the parent duration, and a third time period, greater than the parent duration. Examiner notes that any selected delay time would necessarily be one of less than, substantially equal to, or greater than some other value such as the parent duration.

Regarding claim 32, Hakimi et al. discloses that the interacting further comprises providing a descendant signal corresponding to a descendant duration greater than the parent duration. Figure 10A, for example, shows a descendant duration that is twice the parent duration.

Regarding claim 33, Hakimi et al. disclose that parent signal has a coherence time corresponding thereto and shared by the first and second daughter signals. Again, Hakimi et al.

Art Unit: 2633

disclose that the daughter signals are simply split from the parent signal and would therefore share coherence times.

Regarding claim 34, Hakimi et al. disclose that the interaction endures for an interaction time selected to provide the interaction before the end of the coherence time with respect to the first daughter signal. Figure 11C shows how the variable delay half of the system shown may provide an interaction before the end of the coherence time of the first daughter signal (i.e., the daughter signal split from the incoming parent signal at element 161).

Regarding claim 35, Hakimi et al. disclose that the interaction further comprises recombining the first and second daughter signals to form a descendant signal comprising a first region having a peak duration and second region having a base duration different from the peak duration (Figure 11C shows such a descendant signal).

Regarding claim 36, Hakimi et al. disclose that the base duration and the peak duration are different from the parent duration (Figure 8).

Regarding claim 37, Hakimi et al. disclose that the peak duration is less than the base duration (Figure 8).

Regarding claim 38, Hakimi et al. disclose that the peak duration is substantially less than the base duration and substantially less than the parent duration (Figure 8).

Regarding claim 39, Hakimi et al. disclose that the peak duration corresponds to a comparatively large amplitude and the base duration corresponds to a comparatively small amplitude (Figure 8).

Regarding claim 40, Hakimi et al. disclose splitting the descendant signal into descendant daughter signals and interacting the descendant daughter signals to form a multi-generational

Art Unit: 2633

descendant signal (Figure 10C, for example, shows how descendant signals may be further split and interacted).

Regarding claim 42, Hakimi et al. disclose splitting the descendant signal into at least two descendant daughter signals (Figure 10C).

Regarding claim 43, Hakimi et al. disclose interacting the at least two descendant daughter signals into a second descendant signal to surround a secondary peak region flanked by a secondary base region, the secondary base region comprising a shoulder region, and a skirt region. Figure 6, again, shows how an interacted signal includes a shoulder region (elements 37 and 38) and a skirt region (elements 42 and 44; column 7, lines 19-37).).

Regarding claim 44, Hakimi et al. disclose that the peak region, the shoulder region, and the skirt region are characterized, respectively, by a peak amplitude, a shoulder amplitude, and a skirt amplitude, of respectively descending values (Figure 6).

Regarding claim 45, Hakimi et al. disclose operating on the descendant signal to provide a function generation. For example, Figure 10B shows the descendant signal from the fixed delay half of the system shown is further operated on by a variable delay to produce another output generation.

Regarding claim 46, Hakimi et al. disclose operating further comprises splitting the descendant signal into descendant daughter signals and recombining the descendant daughter signals to form a second descendant signal (Figure 10B).

Regarding claim 47, Hakimi et al. disclose selecting a noise level; selecting a number of generations; encoding a generational descendant signal up to the number of generations, in order to provide a peak region having a substantially shortened peak duration and a base region below

Art Unit: 2633

a noise level. Hakimi et al. disclose that the peak region is detected while the base region falls below a selected noise level so that it is not detected (column 6, lines 64-66). Hakimi et al. also disclose that the number of generations may be 1, 2, 3, etc. (as Figures 10A, 10B, and 10C show respectively).

Regarding claim 48, Hakimi et al. disclose the generational descendant signal is configured to reshape the photonic signal to reduce the energy density in a carrier medium configured to receive the generational descendant signal (Figure 8; column 8, lines 41-58).

Regarding claim 49, Hakimi et al. disclose repeating the steps of providing, splitting, and interacting, and further comprising increasing information throughput in a carrier medium configured to carry the corresponding generational descendant signals. Figure 16 shows a system including providing a plurality of photonic signals (originating from lasers S1-5), with corresponding interactions of daughter signals (through encoder elements 280, which comprise elements such as shown in Figure 10A). In other words, Hakimi et al. disclose repeating the providing, splitting, and interacting across a plurality of signals. Furthermore, Figure 16 shows how the signals are combined to increase the information throughput in the medium (fiber 52).

Regarding claim 50, Hakimi et al. disclose that the signal is a pulse.

Regarding claim 51, Hakimi et al. disclose the parent signal has a characteristic length, corresponding to the duration, and the first and second daughter signals have a coherence length less than the characteristic length. Figure 10B, for example, shows how a parent signal, output from the fixed delay half of the system, may be further split into daughter signals that share characteristic length and coherence length with the parent signal. The daughter signals would also necessarily have coherence length less than the characteristic length of the parent signal,

Art Unit: 2633

since the coherence length of the parent signal is less than the characteristic length of the parent signal.

Regarding claim 52., Hakimi et al. disclose that the first and second daughter signals have substantially identical wave forms with respect to each other and to the parent signal, without consideration of amplitude. Again, Hakimi et al. disclose that the daughter signals are simply split from the parent signal and therefore would necessarily have substantially identical wave forms.

Regarding claim 53, Hakimi et al. disclose an apparatus for shaping photonic pulses, the apparatus (Figures 9 and 10A) comprising

a beam splitter 161 configured to split a parent signal into first and second daughter signals, coherent with each other;

a beam combiner 162 configured to receive the first and second daughter signals from the beam splitter and to provide an interference interaction between the first and second daughter signals during an interaction time;

a delay path (through delay element 160A) extending between the splitter and combiner, configured to delay the second daughter signal for a delay time;

an adjuster configured to adjust the delay time (delay element 160A is a variable delay that would necessarily include an adjuster or means for adjusting the delay time); and

a beam source 174 for providing the parent signal, and having a coherence length selected to have a coherence time at least as great as the interaction time (column 9, lines 8-54).

Regarding claim 54, Hakimi et al. disclose that the adjuster is adjustable between a first position creating substantial overlap between the first and second daughter signals and a second

position creating a substantial gap between the first and second daughter signals (for example, Figure 10A shows how the delay can be set to provide a gap between signals, while Figure 11C shows how the delay can be set to create an overlap).

Regarding claim 55, Hakimi et al. disclose that the apparatus is configured to produce a characteristic time effective to selectively provide constructive and destructive interference between the first and second daughter signals (Figures 8 and 11C; column 8, lines 41-47; column 10, lines 34-39).

Regarding claim 56, Hakimi et al. disclose that the apparatus is configured to divide the energy of the first and second daughter signals between a peak portion having a comparatively greater amplitude and a base portion having a comparatively lesser amplitude (Figure 8 and Figure 11C).

Regarding claim 57, Hakimi et al. disclose that the apparatus is configured to reduce transmission energy density corresponding to the parent signal (Figure 8; column 8, lines 41-58).

Regarding claim 58, Hakimi et al. disclose that the apparatus is configured to increase the information density in a carrier medium configured to receive an output resulting from the parent signal. Figure 16 shows how the signals are combined to increase the information throughput in the medium (fiber 52).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 16 and 41 rejected under 35 U.S.C. 103(a) as being unpatentable over Hakimi et al. in view of Cowan (US 4,399,564 A).

Regarding claims 16 and 41, as well as claim 41 may be understood with respect to 35 U.S.C. 112 discussed above, Hakimi et al. disclose a method for shaping a photonic signal as discussed above with regard to claims 1 and 30 above. They also disclose an attenuator 164 (Figure 11A), but they do not specifically disclose attenuating a descendant signal formed from the first and second daughter signals or attenuating the descendant signal to reduce noise.

However, signal attenuation is well known in the art. Cowan in particular teaches an optical communication system wherein a transmitted signal is attenuated before it is ultimately received (column 9, lines 6-13). It would have been obvious to a person of ordinary skill in the art to attenuate the signal as taught by Cowan in the method disclosed by Hakimi et al. in order to reduce noise in the signal and further distinguish the actual data pulses in the signal. One in the art would have been motivated to provide attenuation simply in order to ensure that the signal is properly received.

8. Claims 59 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hakimi et al.

Regarding claim 59, Hakimi et al. generally discloses shaping the output signal but do not specifically disclose that the apparatus is configured to shape an output signal to match a length of an electronic legacy signal. However, it would be well understood in the art that in an optical communications system, the output signal to be transmitted should be shaped to be compatible with the equipment/electronics on the receiving side simply so that the signal may be properly communicated. It would have been obvious to a person of ordinary skill in the art to shape the

Art Unit: 2633

output in the system disclosed by Hakimi et al. accordingly to match whatever signal characteristics were required/expected by electronics at a receiving end of the system. One in the art would have been motivated to shape the output to match a length of an electronic legacy signal, for example, simply in order to allow the output to be properly received without having to replace potentially expensive receiving hardware.

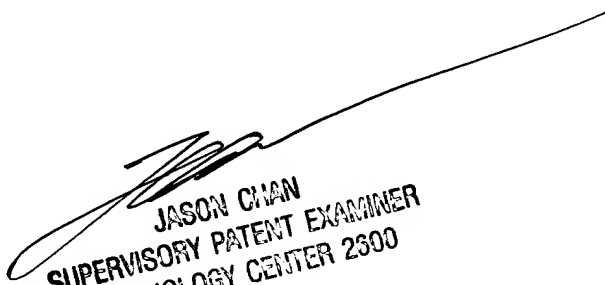
Regarding claim 60, as well as the claim may be understood with respect to the claim objection above, Hakimi et al. disclose that the splitter and combiner may be compact and integrated (Figure 14, for example, shows an integrated splitter).

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 703-605-1186. The examiner can normally be reached on Monday to Friday, 6:30 to 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 703-305-4729. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4700.


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